OPERATIONAL SUPPORT INVENTORY FOR NAVAL AIR REWORK FACILITY ALAMEDA

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NAVAL POSTGRADUATE SCHOOL
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THESIS

OPERATIONAL SUPPORT INVENTORY FOR
NAVAL AIR REWORK FACILITY ALAMEDA

by

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The United States Navy is currently implementing a plan to transfer the NAS Alameda wholesale aviation supply functions to the Navy Supply Center Oakland. Supply Support of the Naval Air Rework Facility Alameda is a vital part of theconsolidation plan. This thesis begins with an overview of NARF Alameda's operation and demand forecasting and ASO policy for Operation Support Inventory are reviewed. Finally, given the pretext that an intermediate level of inventory is desired to support NARF Alameda,

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by

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ABSTRACT

The United States Navy is currently implementing a plan to transfer the NAS Alameda wholesale aviation supply functions to the Navy Supply Center Oakland. Supply Support of the Naval Air Rework Facility Alameda is a vital part of the consolidation plan. This thesis begins with an overview of NARF Alameda's operation and its material support. The current procedures for demand forecasting and ASO policy for Operation Support Inventory are reviewed. Finally, given the pretext that an intermediate level of inventory is desired to support NARF Alameda, suggestions for determining the inventory are made.

TABLE OF CONTENTS

TABLE OF ABBREVIATIONS

ACR	-Allowance Change Request
ASO	-Aviation Supply Office
CLAMP	-Closed Loop Aeronautical Management
DLA	-Defense Logistic Agency
DMI	-Direct Material Inventory
EAMP	-Engine Analytical Maintenance Program
ERDD	-Extended Required Delivery Date
FIC	-Family Identification Code
IIC	-Item Identification Code
IM	-Item Manager
INAS	-Industrial Naval Air Station
MRP	-Material Requirements Planning
NALC	-Naval Aviation Logistics Center
NARF	-Naval Air Rework Facility
NICRISP	-Navy Integrated Repairable Item Scheduling Program
NIF	-Navy Industrial Fund
NIMMS	-Naval Air Industrial Material Management System
NSC	-Navy Supply Center
OSI	-Operational Support Inventory
PEB	-Pre-expended Bin
PLT	-Procurement Lead Time
POE	-Point of Entry
PPR	-Planned Program Requirement
RDD	-Required Delivery Date
SMA	-Supply Material Availability

SMIC -Special Material Identification Code

SPCC -Ships Parts Control Center

SSD -Specialized Support Depot

TIR -Transaction Item Report

UADPS-SP -Uniform Automated Data Processing System-Stock Point

VAD -Value of Annual Demand

VOSL -Variable Operation and Safety Level

I. INTRODUCTION

Navy Supply Center Oakland is scheduled to assume the wholesale aviation supply functions of Naval Air Station Alameda on October 1, 1979. [1:3] NSC Oakland and NAS Alameda are prototype activities for a plan to consolidate and modernize the supply functions at collocated Industrial Naval Air Stations (INAS) and Navy Supply Centers (NSC).

The implementation of the consolidation plan is based upon the recommendations of the DoD Material Distribution Study (DODMDS). [1:8] The DODMDS examined the capacity, operational costs, and transportation costs of 34 major DoD wholesale activities. The three year study was completed in March 1978. Essentially, it determined the number and location of wholesale activities necessary to provide efficient and cost effective distribution of material.

The consolidation is not to degrade the supply support which is currently provided the Naval Air Rework Facility Alameda. [1:20] Rather than being viewed as a constraint, the consolidation presents an opportunity to make support modifications to improve service to the NARF. In order to properly evaluate the changes, a baseline of the NARF Alameda supply support and NARF production programs must be established.

This study was done in order to identify the current sources of supply and modes of inventory management for the Naval Air Rework Facility Alameda. Also, given the pretext that an intermediate level of support inventory is desired for NARF Alameda, alternative processes to provide such an inventory are examined. NARF Alameda is a very dynamic facility and an understanding of the production programs and the internal management of the NARF is required to evaluate the alternative methods of satisfying material requirements. Some of the factors included are: (1) production scheduling (2) material requirement forecasting techniques (3) material usage data base (4) program stability (5) inventory systems internal to the NARF (6) Operational Support Inventory (OSI) and Material Requirements Planning (MRP).

II. BACKGROUND

A. NAVAL AIR REWORK FACILITY ALAMEDA

1. Mission

The Naval Air Rework Facility, Alameda, is part of the large U.S. Naval industrial complex located in the San Francisco Bay Area. The naval facilities included in the complex are the Supply Center Oakland, Mare Island Shipyard, Moffett Field, Oak Knoll Hospital, Concord Naval Weapons Station and NAS Alameda. NARF Alameda is the largest tenant activity of the U.S. Naval Air Station Alameda. The NARF was a department of NAS Alameda from November 1941, when the Naval Air Station was established, until the NARF was commissioned on 1 April 1967. [2]

NARF Alameda is one of six Naval Air Rework Facilities that form the industrial component of the Naval Air Systems Command. The other five NARF's are located at North Island, California; Pensacola, Florida; Jacksonville, Florida; Cherry Pt., North Carolina and Norfolk, Virginia. The six facilities employ nearly 25,000 persons who provide a complete range of rework capabilities for all customers. [2]

The mission of NARF Alameda is to maintain and operate facilities for, and to perform a complete range of

depot level maintenance on designated weapons systems, accessories and equipments. NARF Alameda has the capability to manufacture parts and assemblies; provide engineering services in the development of changes to hardware designs, and furnish technical services for aircraft maintenance and logistics problems. [3:1]

NARF Alameda's primary mission is service to the operational fleet. The NARF personnel point with pride to their commitment to the strong working relationship that exists with the fleet. The other major customers include t the Air Force, Coast Guard, NASA and foreign governments. NARF Alameda employs nearly 4900 civilians and has 28 military personell assigned. During Fiscal Year 1978, it performed reimbursable work totaling $210.5 million. [4:46]

2. Production Program

The Major production programs at the NARF are the aircraft, missile, engine, component and other support programs. Appendix A provides a summary of each of the major production programs for Fiscal Year 1979. The workload for each program is negotiated with the cognizant NARF customer and subject to change due to fluctuations in funding, external priority changes and inaccurate projections of failure rates.

The philosophy during provisioning of weapons systems has been to hold the number of designated overhaul points to an absolute minimum. The provisioning conference

designates only one NARF as the overhaul point for a system or component whenever possible.

The repair capability of the A-6 aircraft at Alameda and Norfolk and the J-52 engine at Alameda and Jacksonville are but two examples of major programs with alternate repair sites. The six NARF's compete for the rework programs and the associated funding to maintain and support the man hour and production capability of the respective NARF. NARF Alameda must remain competitive with the other NARFs or risk the loss of rework programs to an alternate site.

3. Maintenance Philosophy

The maintenance philosophy in the Navy Aviation community is moving away from end item overhaul and toward component repair. The J-52 engine program illustrates the trend from overhaul to repair.

J-52 Engine Program

	FY-73	FY-74	FY-75	FY-76/OT	FY-77	FY-78
Overhaul	185	104	59	91	86	66
Repair	82	112	92	106	123	148

The engines and the associated accessories are not automatically overhauled and "zero-timed" when inducted into the NARF. The trend has been to repair only the current discrepancy and return the engine to "A" Condition. This trend is due to reduced maintenance costs, faster turnaround time and evidence of life extension of the engine. [21]

4. Aircraft Component Rework Program

Contractual arrangements for the Aircraft Component Rework Program (F/E Program) are negotiated quarterly at the Fleet Readiness Support Conference, with the funds provided by the Naval Aviation Logistics Center (NALC). Every week or so, NALC amends the Project Orders to adjust authorized funding levels to the total man-hour level of effort represented by scheduled inductions, work in process and completions. Specific items to be reworked are requested weekly in the priority sequence established by the ASO Navy Integrated Repairable Item Scheduling Program (NICRISP). Actual inductions are determined locally, based on these requests and on the availability of funds, non-RFI repairable assets, capability, and capacity. Experience has shown that inductions representing approximately 15 percent of the overall workload hours will not be completed because of other parts shortages or because the components are beyond economical repair. [3:3]

The B08, Hi-burner and CLAMP programs represent the major subprograms of the F/E Program. The B08 program is characterized by a sporadic and widely fluctuating nature that makes advance planning and rework scheduling extremely difficult. The B08 sub-program is also characterized by short production runs of a diverse range of components that are constantly changing in response to Supply System considerations. Although the B08 program

represents only about 25 percent of the F/E program revenue, it accounts for over 70 percent of the F/E line items inducted. [3:4]

The Hi-burner and CLAMP sub-programs are far more stable since requirements are generated quarterly and NARF can schedule the workload over the quarter to achieve the best work flow. Even with these sub-programs, the components are scheduled by family identification code (FIC) and not by the item identification code (IIC) and, therefore, the actual components to be inducted may not be known in advance. [5]

5. Components in Delay

Components in delay at NARF Alameda have grown 15.5 percent since the first quarter of Fiscal Year 1977. The primary cause for the increase has been lack of material and backrobbing. [4:18]

Backrobbing is defined as the removal of parts from an aircraft/component for use on another aircraft/component with an earlier scheduled completion date. Backrobbing is a useful procedure for maintaining the production schedules. The negative aspect of backrobbing is that duplicate work is required due to the non-availability of parts through normal supply channels. Associated with the direct cost for backrobbing are the costs of program delays that are the result of waiting for material to proceed to

the next task or work stoppage to allow the backrobbing to take place. There is also an administrative cost to route the material to the required aircraft/component. During the period 1 April 1978 thru 31 March 1979, NARF Alameda's workcenters charged 21,186 hours for production delays and 44,857 hours for backrobbing. (see Appendix B). At the present rate of $13.05 per hour for NARF labor, that represents a cost of more than $860,000. There is also the cost of duplicate consumables and additional breakage and malfunctions due to the backrobbing process.

The cost of backrobbing quoted above may only represent a fraction of the actual backrobbing and associated costs. Failure to record backrobbing may be the result of a desire to keep charges for indirect or unproductive labor to a minimum, or to maintain a desired ratio of direct or indirect labor. [6]

6. Management of Condition Code "G" Repairable Components

Condition Code "G" repairable components at the depot level are components suspended from rework either due to lack of requisitioned material or because the components are inhibited from depot level induction due to the lack of essential parts which were previously requisitioned. Essential parts are bit piece items which have a 100 percent replacement factor during depot level rework.

A component is placed in Condition Code "G" only after parts and subassemblies have been requisitioned and the material is not available. The component is transferred from "M" to "G" when status is received that indicates an estimated delivery date in excess of thirty days of the transaction date of the status. Components requiring piece parts, which are local procurement items, will be transferred to Condition "G" if the parts are not available within thirty days of the requisition date for ASO cogs or sixty days of the requisition date for SPCC cogs.

The Condition Code "G" components are held in the physical custody of the Supply Officer. The Supply Department creates Class 203 stock requisitions for all outstanding requirements when the component is transferred to "G" Condition. The NARF provides Supply with a listing of the parts requirements that are submitted as Class 203 stock requisitions. The NARF reviews the listing and initiates cancellation actions as required. (Engines are not transferred to supply but are retained in the NARF spaces in code 94 status until parts are received. The criteria for transferring an engine to Code 94 is that the parts required will not be available by the time the engine is scheduled to be reassembled.)

The parts are joined with the appropriate "G" condition component upon receipt. The NARF is notified immediately when all parts have been received for each "G"

condition component. The Class 203 items are expended to NARF requisitions that the Supply Department holds.

The NARF is required to induct the "G" condition material after notification by Supply that all parts have been received. For ASO cogs, components will be reinducted within two weeks if a current production requirement or a forecasted production requirement exists during quarters 1 through 4 of the Workload Forecast. For SPCC cogs, the components will be reinducted within two weeks if the "M" condition quantity is less than the funded production requirement.

Components may be transferred from "G" (unserviceable, incomplete, awaiting parts) to "F/E" (unserviceable, repairable component) condition when the "G" inventory exceeds authorized levels or is directed by the cognizant ICP. The Class 203 material that was attached to the component is removed and physically and financially taken up in stock. [7]

7. Navy Industrial Fund

One of the features of the National Security Act of 1947 was authorization for the Secretary of Defense to establish working capital funds for the purpose of financing supply inventories and the capitalization of industrial type activities. The largest industrial fund is the Navy Industrial Fund (NIF). [8:302]

The Navy Industrial Fund provides a revolving type of working capital for each NARF activity. The funds expended for labor, material and overhead are replenished by periodic billing to other (customer) activities for whom the work is performed.

NARF activities endeavor to operate without either a profit or a loss during the budget period. Recovery of funds from customers should be commensurate with the actual costs required to accomplish the job.

The NIF store is an inventory system which is funded from the NARF NIF budget. The NIF store and Pre-expended bin (PEB) operation comprise the extent of NARF's internal material support.

III. NARF ALAMEDA MATERIAL SUPPORT

NARF Alameda's pre-consolidation material requirements are locally supported from the NARF's internal NIF Stores, NAS Supply and NSC Oakland. The post-consolidation material requirements will be locally supported from the NIF Stores and NSC Oakland. The levels of inventory (wholesale, intermediate or consumer) from which the material support is drawn will be addressed in this chapter for each of the supporting activities.

The distinction between the wholesale and the retail systems within the Navy is not completely clear.

> The current Navy definition of wholesale stock for Navy managed items is "these stocks for which the IM retains visibility through receipt of TIR's." The fact that some activities make daily TIR's to the Aviation Supply Office (ASO) or the Ship's Parts Control Center (SPCC), but still compute their own requirements and initiate their own replenishment requests, sometimes causes difficulty in understanding the Navy Supply System. [9:III-1]

RIMSTOP recommended a level of inventory between the wholesale and consumer levels of inventory to support specific consumer organizations or activities. [10:II-2] The consumer level of inventory is held only by the final element in an established supply distribution system for the sole purpose of internal consumption. The intermediate level of inventory is that inventory between the wholesale and consumer levels, regardless of funding. The "retail

inventory" is a term that collectively describes the supplies held below the wholesale level. The Navy inventory levels of supply material flow are exhibited in Appendix C.

Flow diagrams of the pre- and post-consolidation requisition and material flow diagrams are presented in Appendix D. [5]

A. NIF STORE

The NIF Stores material is restricted to NSA (Naval Stock Account) and DLA (Defense Logistic Agency) material and non-standard items not carried by the Supply Department. The material is located in storerooms within the NARF and is under the physical and financial control of the NARF.

The NARF Material Planning personnel determine the items of material that are to be stocked and procured by the NARF for end use or Direct Material Inventory. The planning personnel utilize budget guidelines, workload forecasts, material requirements and historical demand to determine the stocking levels.

1. Material and Supplies Inventory

The NIF Store sotcking criteria for expense item material is a minimum demand frequency of six per quarter. Approval for establishing items in the Alameda NIF Stores is restricted to Material Section Heads or higher. The

Material Planners are allowed to establish NIF Stores items with a unit cost of less than $25. [11]

The Alameda Material Planners are primarily former technicians, and they rely upon their shop experience and a strong working relationship with the workcenters to determine material requirements. Presently, the planners do not have a complete bill of materials from which to forecast, and they must rely on provisioning documents to identify piece part to component. [11]

The establishment of a new item requires the Material Planner to manually prepare a DD1348 in UADPS-SP format, create a Material Planning Card, determine the order quantity and establish a low limit. When an established item is reordered, he receives a copy of the replenishment DD1348 and retains a copy in a suspense file pending receipt of the material.

The NIF Stores at NAS Alameda is a manual stock record operation. The NIF Store material has increased from just over $2,000,000 to over $5,000,000 during the past year. [12] The main cause for the increase has been the ASO Industrial Forecasting Program for engine items that will be discussed in Chapter IV.

2. Pre-expended Bin Operation

The Pre-expended bin (PEB) concept is a proven method of providing effective and timely material support for the industrial efforts of rework facilities at a

minimal effort and cost. The PEB's contain high usage, low unit cost items that have been expended from stock records and charged to overhead at the NARF.

The following criteria for establishment of stock levels for PEB's are found in OPNAV Instruction 4790.27, Volume II. The maximum inventory of any one outlet is not to exceed a 30-day estimated supply. Items that have a unit application of less than the unit of issue or those that are subject to package issue conditions may be carried at the unit of issue or standard package quantity. The PEB items are not to duplicate material stocked in the NIF stores.

The PEB operation at NARF Alameda represents a major portion of the material support for the industrial operations. At present, there is material valued in excess of $1,000,000 at 63 PEB locations throughout the production areas, which under the PEB concept are not recorded on official records. The material is held and new items added to the PEB system primarily on the advice of shop foremen. [13:25]

3. Customer Furnished Material (CFM)

The NARF maintains physical records of material provided by customers for use on their own jobs. The material is expended as it is drawn to support the customer's job, and any excess material is returned to the customer upon completion of the job.

4. Naval Air Industrial Material Management System (NIMMS)

NIMMS is designed to enable NAVIAIREWORKFAC Material Managers to monitor and regulate the flow of material to production and optimize inventory levels and material support. The NIMMS computer programs process inventory transactions, and issues of material, and privide management reports. The NIMMS is designed to operate daily and a minimum of three daily runs should be made each week for efficient operation. NIMMS is scheduled for implementation at NARF Alameda in December 1979. Training of the NARF personnel is currently being conducted to familiarize them with NIMMS.

NIMMS provides the management system necessary to implement Direct Material Inventory (DMI) concept to gain better physical and financial control within the NARF. DMI includes items required on a one-time basis for a specific job. The material is reserved by a Planner on a bona fide customer order and issued to a specific end use job order. The material is centrally located and segregated until drawn by the workcenters. Implementation of NIMMS and DMI at NARF North Island required the construction of 13 secure material storage areas within the production space. Approximately 30 additional personnel were transferred to the Material Management Branch to handle the increase storage and administrative burden. It is estimated to cost $600,000 annually to operate the DMI site at NARF North Island. [14:8]

The NARF Alameda workload for the first quarter of Fiscal Year 1979 was 69.5 percent of the NARF North Island workload. [4:27]

The Material Planner and Storeroom operator are the primary personnel involved in the NIMMS operation. The Material Planner is tasked to perform the following established planning practices [15:3] :

1. Nomination of items to be carried as NIF inventory items.

2. Establishment, review and resetting of stock levels for NIF inventory items.

3. Approval of material substitutions and designation of interchangeable items.

4. Deletion of NIF Items Records (NIFIR's) and disposition stock affected by the deletion.

5. Establishment of a Store Unit of Issue for items issued from a store in increments which differ from standard Units of Issue.

6. Assignment of replenishment codes to each NIFIR.

7. Maintenance of the NIF inventory file and optional Master Issue Data file.

The NIMMS program determines if automatic replenishment of NIF Store items is required whenever there is a reduction of on-hand stock. The replenishment quantity is based on the Value of Annual Demand (VAD) of the individual NIF item record. The VAD of each NIF retail store item is

computed quarterly during stratification category code processing. The 'low money value' is the minimum value of annual demand (VAD) that a line item requires to qualify for a stratification category. The VAD interval for each stratification category is determined by the low money value parameter.

> Quarterly a stratification low money value parameter is input to stratify the retail store inventory, inventory, based on the value of annual demand. The value of demand of each store master file is calculated, the entire retail store inventory is then stratified on the basis of the VAD. The object being to obtain the best requisition effectiveness within authorized investment levels and workload constraints, the dollar value intervals for each stratification code are determined. The percentage of line items whose VAD falls within the range of the dollar value intervals for each of the stratification category code is calculated. Each Retail store NIFIR is updated to include the stratification category code that corresponds to the range of dollar value intervals in which its VAD falls. The quarterly process will produce a 'NIF Retail Store Stratification' report and a 'Stratification Category Code Changes' report. The store stratification report is a one page report which lists the category code, dollar value intervals, and the percentage of line items within each category code. The category code changes report lists by store, the stock number, the old and new stratification category codes, and the VAD. [15:56]

The formula for the automatic replenishment of NIF retail store items is described in Appendix E.

Cards recommending that an item be established in NIF are produced by the Quarterly Item Recommendation processing sub-system. The end-use items must meet the criteria for NIF Retail Store stocking and have a frequency of demand for the previous two quarters which equals or exceeds the quarterly frequency parameter.

The demand history is available for all requisitions and may be requested by FSC and/or NIIN, SMIC, Job Number, Shop Number or Store Code. A bill of materials by component Item Identification Code (IIC) or Family Identification overview of fiscal management products is presented in Appendix F.

B. NAS ALAMEDA SUPPLY DEPARTMENT

NAS Alameda is one of six air stations that are designated as primary stock points and are the usual consignees for material procurred by ASO. The air stations were selected because of their collocation with and supply responsibility to the six industrial Naval Air Rework Facilities.

Prior to the consolidation, NAS Alameda Supply issued material based on local customer requisitions or in response to material release orders passed by ASO. Supply also performed other functions related to industrial activities in support of NARF Alameda. The primary functions were Non-RFI component storage and induction, control of "G" condition material, expediting "G" condition parts requirements, matching bit and piece receipts to "G" condition components, condition code transfers and Direct Turn-Over (DTO) material receipts/issues.

The management of "G" condition material is a multi-million dollar operation. The "G" condition material at NAS Alameda averaged over 4600 components during the period

April thru June of 1979. These components averaged 2.14 bit and piece requirements per item. Appendix G provides a summary of NAS Alameda "G" condition material for April, May and June 1979.

After the consolidation, NSC Oakland will assume the NAS Alameda functions associated with the support of NARF Alameda. NAS Alameda will retain 144 of its current 540 personnel and will provide Retail Supply support for the air station, its squadrons, its tenants and other designated activities. NAS Alameda will operate as a Level II air station and continue to support its Retail customers. [16]

1. ASO R Cog Items

a. IR Cog Expense Items

Prior to consolidation, NAS Alameda supported NARF Alameda as a wholesale customer for R Cog material. The wholesale stock levels were maintained by ASO on a push basis. Unfilled NARF requirements were transmitted to ASO for referral, procurement or other action as required. During the second quarter of FY79, NAS Supply received 10,213 1F Cog demands that represented 21.6 percent of the total NARF National Stock Number (NSN) demands. The Point of Entry (POE) effectiveness during the same period was 53.2 percent.

NAS supply also maintained Retail level 1R stock to support the air station, its squadrons, its tenant

activities and other designated activities. The retail stock levels are established by the Operational Support Inventory (OSI) that is tailored to support the NAS Alameda retail customers. (The OSI will be discussed in detail in Chapter V.) NAS Alameda Supply issued OSI Retail stock to fill critical NARF requirements on an exception basis. This was accomplished only after it was determined that there would be no impact to the support of the retail customers. [15]

b. 2R, 5R, 6R, 8R Cog Investment Items

The NARF R Cog investment material requirements were referred directly to ASO by NAS Supply with the exception of CLAMP requirements which were processed off-line by ASO Field Representatives. During the second quarter of FY79, the 2R, 5R, 6R and 8R Cog requirements represented 1474 demands or 3.1 percent of the total NARF NSN demands. The NAS Supply Effectiveness report for NARF Alameda for the second quarter of FY79 is contained in Appendix H. [18]

2. 9 Cog Items

Prior to consolidation, NAS Alameda Supply supported NARF Alameda as a retail customer for 9 Cog material. The NARF's demand history was included in the VOSL computation for 9 Cog retail stock levels. During the second quarter of FY79, NAS Alameda received 35,132 NARF standard demands for 9 Cog material. The Point of Entry (POE)

effectiveness during this period was 74.4 percent. [18] The unfilled 9 Cog requirements were referred to NSC Oakland to be filled or referred to the cognizant ICP.

3. SPCC Items

The NARF Alameda material requirements for 1H SPCC managed material was supported from NAS Supply retail stock. The 1H Cog demands represented .95 percent of the total NARF NSN demand during a six-month period in FY79. The Point of Entry (POE) effectiveness during this period was 55.7 percent. [18] The unfilled requirements for SPCC material was referred by NAS Supply to NSC Oakland.

4. Non-standard Items

The non-standard NARF demands are requirements for support items that do not have a National Stock Number (NSN) assigned. The table shown below provides a comparison of non-NSN to NSN 1R Cog demands. In excess of 95 percent of the non-standard demands were assigned 1R Cog, and for the second quarter of FY79 represented 33 percent of the 1R demands and .94 percent of the total NARF demand (approximately the same as 1H SPCC Cog items). [18]

1R COG	JAN	FEB	MAR	TOTAL
TOTAL DEMAND	4192	5290	5839	15,321
STANDARD DEMAND	2959	3334	3920	10,213
NON-NSN	1233	1956	1919	5,108
PERCENT NON-NSN	29.4	36.9	32.8	33.3

In a sample of 2800 non-NSN requirements, 2200 (78.6 percent) were part numbered and were subject to local procurement action. The remaining 600 (21.4 percent) were items with local stock numbers assigned. The local stock numbered material includes NARF-manufactured items and general support materials, such as sand for sandblasting that does not have NSN assigned. NARF received CA status (rejected) from NAS Supply for over 50 percent of the local stock number requirements sampled.

The less than 2000 local stock numbered items carried by NAS Alameda are to be individually screened for retention by NSC Oakland after the consolidation.

C. NSC OAKLAND

Relative to the supply requirements of the NARF, NSC Oakland is a Specialized Support Depot (SSD); that is, an activity with a specialized mission as to the type of material or scope of support.

Replenishment of stocks is centrally controlled by the cognizant Defense Logistic Agency (DLA) Item Manager. The SSD stocks are funded and owned by the DLA Item Manager. The SSD activity is responsible for material issues and associated transaction reporting to the DLA IM. Requisition may be received and processed from Navy activities or material issues may be directed by the IM to satisfy requisitions processed centrally. [8:II-10]

The five major SSD Cogs with respect to NARF Alameda material support are 9C, 9D, 9G, 9N and 9F. During the second quarter of FY79, the 9N and 9Z Cog material requirements alone represented 46.7 percent of the NARF NSN demand while the combined "big five" requirements accounted for 59.1 percent of the total NARF NSN demand. [18]

During the second quarter of FY79, NAS Alameda filled 40.8 percent of the "big five" SSD requirements from Retail stock. NSC Oakland received over 5500 requisitions each month for the "big five" material for this period. [18] After the consolidation, NARF Alameda will no longer have the level of protected support for the SSD Cogs provided by the NAS Alameda Retail stock.

After the consolidation, NSC Oakland will perform all the supply functions related to the support of the industrial activities at NARF Alameda. The primary functions are non-RFI component inductions of 95,000 per year; control of "G" condition material, averaging over 4500 components; match bit and piece receipts to "G" condition components; expedite "G" condition parts requirements (which average over 4900 requirements) and perform condition code transfers and DTO material receipt/issues. NAS Alameda will transfer 396 personnel to NSC Oakland as part of the wholesale operation to assist in the increased workload.

IV. MATERIAL REQUIREMENTS FORECASTING

The NARF Alameda Material Planners are responsible for forecasting the material requirements based upon the projected production schedule. The Planners are assigned to a production program (Engine, Avionics, Hydraulics) and are organized within the program by the Federal Supply Class (FSC).

The Planners presently have a very limited number of mechanized products to assist them in forecasting requirements. The UADPS-SP programs will provide usage by NIIN or FSC. Unfortunately, this is the total consumption of the NARF and not itemized by shop or component. The NARF has an internal consumption report on microfi he that provides a listing of the material expended on a Job Number. However, the usage information must be manually extracted from this source. [19]

NARF Alameda's Standard Procedure Instruction 4490.1C requires the Planners compute demand for items with a 70 percent replacement factor and higher. Essential bit piece support items receive additional attention. Essential material is a 100 percent replacement item that cannot be manufactured locally. The essential items comprise 5 to 10 percent of the material requirements. [20] The Planners were unable to comply with this instruction due to the lack of mechanized data processing. [11]

The Planners concentrate on the essential items and items that have caused delays or required backrobbing in the past. The Planners maintain a strong relationship with the work-centers, which enables the Planners to keep abreast of changing material requirements. The Planners manually compile listings of the items that historically have been problem items.

The forecasting effort can be characterized as having either a near-term or a long-term horizon. The near-term forecasting is for material available in the supply system or from other sources to support the next quarter's production schedule. The long-term forecasting is for items that are not available and are procurement lead time away (which may be 18 to over 36 months). [21]

Increased production delays, backrobbing and requirements of the Operational Fleet have prompted the development of special programs to improve the NARF forecasting process. Two of the programs that are currently under evaluation at NARF Alameda are the ASO Engine Requirement Demand Forecasting program and Material Requirements Planning (MRP).

A. ASO ENGINE REQUIREMENT DEMAND FORECASTING

The ASO program to include NARF demand forecasts in the ASO requirements determination and budget process is delineated in ASO Field Instruction 4440.95. The program is the result of a July 1977 Naval Supply Systems Command

sponsored workshop that was convened to improve supply support of NARF 1R Cog item requirements. The items were restricted to relatively homogeneous groups of components and/or systems for which historical demand data understates the forecasted future requirements due to the following conditions:

> a. Technical changes (e.g., age distress or low-cycle fatigue conditions) which have caused or will cause revisions to prior to replacement rates.
>
> b. Deficiencies in existing requisitioning and/or demand recording procedures which have caused historical demand data to be understated. [22:3]

The program was not intended to support requirements associated with significant changes in the quarterly schedule, critical supply status unrelated to (a) or (b), or major technical or maintenance philosophy changes.

The NARFs nominate the components and/or systems that they desire to be included in the program. The NARFs or ASO may identify individual items of supply to be processed under the terms of the program. The NARFs are required to prepare review data for each increased demand item that categorize the reason for the increase and predict the increases by individual quarter. A material requirements negotiation conference is held to reconcile differences between NARF historical demand data and ASO and the NARF.

The final determination of which activity, ASO or NARF, will fund the procurement of the demand delta for the

material is based upon a sharing of risk. The demand delta is the projected two-year increase in NARF requirements. The computation of the demand delta is the two-year NARF forecast demand minus the ASO recorded demand for the past year multiplied by 2. ASO computes the delta requirements for the approved items for which ASO establishes Time-phased Planned Program Requirements (PPRs), and the NARF submits Extended Required Delivery Date (ERDD) requisitions.

1. Risk

There is an associated risk present whenever material is procured on the basis of forecasted demands. Although the demand deltas are based on demand forecasts for a two-year horizon, the initial investment risks are limited to the first five quarters. [22:5]

The investment risks are classified as either an ASO Risk item or a NARF Risk Item based upon comparison of the demand delta with both the Risk Decision Quantity and the Risk Decision Value.

a. An ASO Risk Item is an item for which ASO will unilaterally support the projected demand forecast because the demand delta is less than or equal to either the Risk Decision Quantity or the Risk Decision Value.

b. A NARF Risk Item is an item for which the NARF will support its demand forecast by ERDD requisitions because the demand delta is greater than both the Risk Decision Value and the Risk Decision Quantity.

c. The Risk Decision quantity is based on the historical demand of the item. An item that has a requisition average greater than one per month or a historical demand quantity of greater than 25 per quarter is a fast-moving item. The Risk Decision Quantity for slow-moving items is a quantity equal to one quarter's system average demand.

d. Risk Decision Value is a demand delta extended value equal to $500.

2. ERDD Requisitions

An Extended Required Delivery Date (ERDD) requisition is a requisition for material that is required not less than sixty days and not more than two years from the date the document is prepared. [22:2] Neither shipment of the material nor billing of the NARF is acceptable earlier than 50 days prior to the required delivery date.

The cognizant NARF prepares the ERDD requisitions for the first five quarters for the NARF Risk Items. The NARF will continue to monitor the forecasted demand and coordinate any changes with ASO.

3. Time-phased Planned Program Requirement (PPR)

The Time-phased Planned Program Requirements are a series of PPRs which incrementally support known or anticipated future material requirements. They are designed to expire sequentially so that one PPR will expire at the

beginning of each successive quarter. [22:3] Each PPR cites a quarterly delta quantity and a RDD equal to the Julian date of the first day of a calendar quarter.

Funded PPRs are placed in the ASO Planned Program Requirements File (PPF) for the first five quarters of the forecast period. They are additive to the Reorder Level as soon as the RDD is within the Procurement Lead-time (PLT) of the item. If the RDD is beyond the PLT, the PPR is reviewed periodically until it is within the PLT.

Unfunded PPRs are also placed in the PPF for the last three quarter increments. They are not additive to the Reorder Level and do not initiate any procurement action. The unfunded PPRs are additive to the System Retention Limit and protect the assets from being disposed as excess items. [22:2]

4. Program Implementation at NARF Alameda

The forecasting program has been utilized to support the Engine Program at NARF Alameda. A Planner in the Engine Material Section stated that the major problems have been extensive manhours to prepare the NARF review data, receipt of material prior to RDD, material not received during the quarter requested and fluctuations in the production schedule.

This Planner had recently been involved with preparing the review data for a TF-34 negotiation conference.

More than 280 manhours were expended by the Engine Material Section alone to manually formulate the 200 data sheets. [19]

The NIF stores' inventory has increased due to the receipt of ERDD requirements prior to the scheduled delivery date. The material required for more than one quarter, and in some cases all five quarters, was received at the same time. After three quarters of the initial J-52 requirement forecast, $242,000 (53 percent) of the NIF receipts had not been issued due primarily to the premature receipt of the material. [21]

B. MATERIAL REQUIREMENTS PLANNING (MRP)

The ability to meet an industrial production schedule necessitates having the material available when it is required. The problem can be simplified with a computer utilizing MRP methods. MRP is a refinement and extension of previous methods that integrate piece-meal methods into a single system.

> In one sense, material requirements planning is simply a computer program for production. It enables management to time in the most efficient way the ordering and manufacturing of components and sub-assemblies that make up completed products. In a broader sense, however, it represents a complete set of related activities that begin with forecasting and order entry and end with feedback from the shop floor. This feedback 'closes the loop,' and thereby allows planners to schedule within expected capacity limits. [23:106]

The material requirements are developed from a Bill of Materials (BOM) which is a list of the previous gross requirements for a given component. The future requirements are computed by factoring the components' gross requirements by the production schedule.

The successful MRP requires the industrial activity to be integrated with a formal system. It requires requisitioning discipline in order to produce a believable product. The integrity of the system must be maintained in order to increase productivity and reduce inventory costs.

1. Management by Weapons System

The Weapons manager concept at ASO functions at the wholesale inventory level, but it has significant deficiencies when applied to the retail level. The Weapons System Management concept compiles a bill of material based upon the Special Material Identification Code (SMIC). Currently, the SMIC is not maintained upon wholesale management transfer from the Navy. The result is the loss of weapon system visibility on 9-Cog items.

2. NARF Alameda MRP

NARF Alameda is currently developing MRP techniques to support the generation of a local Operational Support Inventory (OSI). The first phase to develop computer programs for analysis of the F/E Program is completed and phase two will incorporate the Engine Program.

The programs extract the demand history by Customer Order Number which is then collated by Item Identification Code. The Customer Order Number induction information is collated by IIC. The component schedule by FIC is factored to give a forecast by IIC. The average requirements for expense items are then computed for each IIC. The demand forecast is developed by IIC for the forecast component scheduled inductions. The total expense requirements by FIC is forecasted, and a final product of total requirements for expense parts is produced (see Appendix I). The following files are constructed:

a. Demand Data File
b. Induction Data File
c. Bill of Materials File
d. Workload Schedule File

The initial development of MRP at NARF Alameda has revealed a lack of ordering discipline. Material is being requisitioned on incorrect Customer Order Numbers, total requirements of an item for a quarter of inductions are ordered on a single requisition, and excess material (spares) are being requisitioned. The MRP program will improve the discipline by automatically rejecting wrong Customer Order Numbers, and the quantity ordered will be compared to the units per assembly for the component. [5]

V. OPERATIONAL SUPPORT INVENTORY (OSI)

The Retail support program for Navy air stations is identified as an Operational Support Inventory. The OSI is a protected, funded level of stock for the exclusive use of each air station. It is tailored to support their flying hour program in accordance with the maintenance plan. The goal of OSI is the improvement of fleet support within the constrained resources available.

> The OSI is a retail stock level comprised of a 'fixed allowance' for investment items (field and depot level repairables), and a 'fixed stock level' for expense items (consumables). The OSI is the quantity of material required to support at a given site, the unique maintenance mission assigned to that site. [24:2]

The OSI levels for aviation material are centrally computed and the requirements validated to comply with Office of the Secretary of Defense (OSD) budget process requirements.

> Authorized retail stock levels for ASO managed items will be recorded in the ASO computer files as planned requirements/reservations, which can be changed only by ASO (RO Division). These reservations will afford protection against referrals with the exception of priority 01 and 02 (not mission capable supply) and other priority 01 requisitions which may be referred. ASO will establish positive controls to ensure only the above requirement will be referred against station OSI assets. [24:2]

The first Navy Stock Fund (NSF) funding for the OSI expense item requirements was received in Fiscal Year 1976 and 1977. The majority of the Aircraft Procurement, Navy (APN) funds for procurement of investment items was received in Fiscal Year 1978. Operations and Maintenance Navy (&MN) funds were budgeted in Fiscal Years 1977 and 1978 for the repair of F/E Condition material to satisfy the OSI requirements. A separate funding was budgeted for a special OSI retail level at NAS Subic to support critical WESTPAC operations in the Indian Ocean. The majority of the funds for Subic have been received. The final $10,700,000 of APN funds is due in Fiscal Year 1980. A summary of OSI funding is provided in Appendix J. [25]

A. FIXED ALLOWANCE LEVELS

The Fixed Allowance can be set and changed only by ASO. The requirements for Fixed Allowances are determined by the sum of the attrition and rotatable pool requirements. The attrition requirement is established when an activity is unable to repair a Fixed Allowance item and the item is BCM'd (Beyond Capability of Maintenance) off-station. The attrition requirements are determined from BCM actions, normally over a one-year period. that are factored by the fly hours of the base period and the future period.

Rotatable pool items are those repairable items required to be available for immediate installation in an

aircraft or its associated equipment while the failed units are being repaired locally by the AIMD (Aircraft Intermediate Maintenance Department) or IMA (Intermediate Maintenance Activity) based upon individual site capability. Items will qualify as rotatable pool items when there is a predicted demand of one or more in 30 days. Rotatable pool is included in the OSI. The computations for Fixed Allowance Levels are delineated in FASO Instruction 4441.E.

The activity stock level quantity recorded in the ASO computer files is used in the MARQ (Maximum Allowable Requisition Quantity) formula to process stock requisitions. The MARQ system screens all incoming stock requisitions from TIR activities by comparing the Fixed Allowance with the activities' assets and rejects requisitions for quantities in excess of their Fixed Allowance.

> The activity stock level quantity (i.e., reservation quantity) recorded in the ASO computer files will be used in the MARQ (Maximum Allowable Requisition Quantity) formula in processing investment item stock requisitions. Any portion of an investment item stock requisition exceeding the MARQ formula ((Purpose Code W reserved planned requirements plus prupose code W due out) minus (Purpose Code W on hand plus Purpose code W due in plus Purpose code W due in from maintenance)) will be rejected with status code RF. [24:2]

The Fixed Allowances for investment items are recomputed on a biannual cycle or when major changes to the base loading take place. An ACR (Allowance Change Request) may be submitted for 2R, 8R, 8N, 4F, 1RD and items managed under CLAMP to change the OSI allowance for individual items.

The following is the POE effectiveness for 2R Cog material for a Level I (Alameda) and two Level II air stations under OSI. The NAS Alameda POE computation includes the NARF demands and does not represent a measurement of the effectiveness of the OSI. [25]

	1976	12 months ending June 1979
Alameda	70.4%	71.3%
Lemoore	41.6%	58.3%
Oceana	48.1%	53.0%

B. FIXED STOCK LEVEL

The "Fixed Stock Levels" are set by ASO quarterly for TIR activities. The activities are required to incorporate the new settings within 10 working days after receipt. The items in this category are required to meet a demand criteria or to support a protected aircraft or system.

An aircraft or system is protected from the requirement to satisfy the demand criteria if (a) it was on station less than 12 months; (b) it has been less than 18 months since the Material Support Date; (c) the aircraft are in small detachments of four or less; or (d) the support equipment is contained in the IMRL (Individual Material Readiness List). The allowance for the protected items is computed annually, with the allowance being the higher of the site demand or the protected quantity.

The items that do not meet the protection criteria require a demand frequency rate of 2 or more in 12 months in order to meet the stocking criteria. The depth of stock is a 90-day stock level, plus Order and Shipping Time of 31 days for CONUS and 53 days overseas. A quarter counter method is utilized to effect a simplified smoothing of demand. The previous 12 months demand is factored by the number of quarters demand occurred since the first quarter. [26]

The demand as recorded at ASO is utilized to compute the Retail stock levels with the exception of the Industrial Naval Air Station.

> INAS activities POE (Point of Entry) demand extracted by UADPS-SP (Uniform Automated Data Processing System for Stock Points) demand analyzer programs will be used in lieu of ASO file data since UICP has no capacity of separating wholesale and POE demands. The site's factored demand will be compared to protected optimized allowances and the higher of the two will constitute the authorized activity stock level. This data will be furnished in accordance with enclosure (3) specifications. For those activities where ICP and UADPS-SP demand is not available, 3-M data will be utilized. [24:9]

Allowance Change Requests (ACRs) are not submitted for 1R Cog items except for 1RD. Under selected circumstances interim stock levels may be set locally, pending the quarterly review. The following is the 1R Cog POE efficiency for fixed level stock at a Level I (Alameda) and two Level II air stations. The NAS Alameda POE computation includes the NARF demands and does not represent a measurement of the OSI effectiveness. [25]

	1976	12 months ending June 1979
Alameda	51.7%	47.0%
Lemoore	49.7%	60.1%
Oceana	46.8%	54.2%

ASO will provide a recommended retail stock level for non-R Cog items (mainly 9 Cog) based on the criteria and frequency established by NAVSUP. The designated activity will make a local determination as to the stocking level.

C. NAS MIRAMAR 1R Cog VOSL TEST

Navy Supply System Command authorized a test of 1R Cog material management under the VOSL (Variable Operation and Safety Level) program at NAS Miramar and tasked FMSO (Navy Fleet Material Support Office) to provide the VOSL parameters. Prior to the test, NAS Miramar set levels using the OSI decision rules delineated in ASO Field Instruction 4441.16E. The fixed levels were based upon fixed months of supply.

The purpose of the test was to determine whether a higher SMA (Supply Material Availability) for the same investment could be attained while not negatively affecting the operational measure of effectiveness. There was a potential for significant savings in inventory investment or increases in SMA. [27:1]

FMSO modified the VOSL Analyzer to incorporate the protected IOL (Initial Outfitting List) OSI concept.

> (1) Protected Items. If the item is protected and demand-based, the reorder point is selected as the higher of the OSI reorder point ($\frac{1}{2}$ protected IOL quantity) or the computed VOSL reorder point. If the OSI reorder point is selected, the requisition objective is set equal to the full IOL quantity. If the VOSL reorder point is selected, the VOSL requisition objective (computed VOSL reorder point plus computed VOSL operating level) is used.
>
> If the item is protected and nondemand-based, the item is excluded from any VOSL considerations. The OSI reorder point and requisition pbjective apply.
>
> (2) Nonprotected Items. Nonprotected, demand-based, the items receive standard VOSL reorder point and requisition objective. Nonprotected, nondemand-based items are excluded from any levels computation. [28:2]

Appendix K contains the detailed inventory decision rules, VOSL parameter settings for 1R Cog, and the summary of statistics from the VOSL analyzer run. The settings were to provide for a 1.5 month Safety Level and a 2.0 month Operating Level.

The test commenced in August of 1978, and after nine months, the initial goals had been met or exceeded. The 1R Cog contribution to the Not Operational Ready, Supply (NORS) and the Not Fully Equipped (NFE) documents per aircraft had decreased 23 percent (55 percent in August 1978 to 42 percent in May 1979). The value of the on-hand VOSL inventory had been reduced $597,000 or 20 percent ($3,008,978 August 1978 to $2,411,503 May 1979). The

1R Cog VOSL MSIRS were reduced by 299 line items (3929 MSIRS in August 1978 to 3630 MSIRS (Master Stock Item Records) in May 1979). The value of the 1R VOSL combined requisition objective (RO) was reduced approximately 25 percent ($3,132,789 RO in August 1978 to $2,346,857 RO in May 1979). The Average Investment Level (AIL) was decreased from $2,600,000 to 2,480,000. The 1R Cog POE effectiveness was 64 percent in August 1978. It dipped to 59.4 percent in November 1978 and was on an upward trend at 64.3 percent in May 1979. [29]

The primary problem encountered during the test was the timely loading of the quarterly data base at ASO. NAS Miramar also requested the AIL goal be raised from $2,500,000 to $2,800,000 to provide increased effectiveness and improve the Operation Readiness of the Squadrons supported. [29]

VI. CONCLUSIONS

The increases in backrobbing, components in delay and production costs at NARF Alameda are primarily the result of insufficient material support. The NARF Material Planners maintain that they require 100 percent SMA. The material support level that is required is definitely greater than the approximately 50 percent level currently provided. The material availability goals for shore activities supporting aircraft set by OPNAV Instruction 4441.12 may prove sufficient and be financially feasible. The objective would be for an overall OSI performance that would fill 65 percent of all demands and provide overall availability of 85 percent for items stocked.

The current material support of NARF Alameda is remarkable considering the lack of mechanized data processing capability for requirements planning. As discussed in Chapter III, the manual manipulation of data is so time-consuming that it restricts the evaluation of requirements to a small percentage of the total bit-piece population.

To meet the goals of improving the supply support of the NARF and reducing the delays due to parts shortages and backrobbing will require the establishment of an intermediate level of inventory because the NARF production programs will lose the protection provided by the NAS

Alameda's retail stock after NSC Oakland assumes the wholesale support function. The question to be considered is not whether an Operational Support Inventory (OSI) is desired, but rather how it will be developed and operated.

A. NAVAL AIR INDUSTRIAL MATERIAL MANAGEMENT SYSTEM (NIMMS)

NARF Alameda will implement NIMMS to manage the NIF stores at their present level. However, the NIMMS programs are designed more for financial control and reporting rather than inventory control. The automatic replenishment program is not very sophisticated and would not be a candidate to compute OSI inventory levels. The NIMMS data is built on job order number and NIIN linkages and would not provide a bill of materials by component.

B. MATERIAL REQUIREMENTS PLANNING (MRP)

The trend in maintenance philosophy in the Navy aviation community is away from end item overhaul and toward component repair. This philosophy requires material planning at the component repair levels. The logical place for MRP is within the industrial activity where the work is accomplished and the data are available to construct the bill of materials.

The MRP concept is valid for near-term requirements forecasting but will require additional program parameters for long-range forecasting. Forecasting requirements for

two or three years away will require probabilistic demand factoring. The investment level involved has a high level of uncertainty when considering less than 30 percent of the requirements have a 70 percent or higher replacement factor. However, long-range planning is essential for support of the NARF.

The foundation of the MRP concept is a relatively stable production schedule. The B08 program will remain sporadic and widely fluctuating due to the characteristics of the program. However, it involves only approximately 10 percent of the NARF's total business. The aircraft program, engine progrmms, CLAMP and Hi-burner programs are capable of increased stability as a result of realistic scheduling and reducing the schedule fluctuations.

C. OPERATIONAL SUPPORT INVENTORY

The ASO policy and operational procedures as delineated in ASO Field Instruction 4441.16F are not suited for support of a Naval industrial activity. They have been marginally successful in supporting the 1R Cog retail sales at the air stations. Replacement of the simplistic method utilized for computing fixed inventory levels for expense items by the VOSL program is anticipated by mid-1980. [29] Unfortunately, the VOSL program is designed to optimize stock turn and is based on past demand rather than requirement planning.

ASO does not have the data base required to relate bits and pieces to the individual component. The logical place to develop the data base required to compute the fixed inventory levels for the NARF OSI is at the industrial activity. The fixed inventory levels would be the function of requirements by IIC and the production schedule.

D. DISCIPLINE

The achievement of the benefits offered by MRP requires ordering discipline within the NARF. The ordering of bench spares and excess material skews the demand base. Programs can be established to screen the NARF shop requirements but would always be subject to work-arounds. The success of the OSI based on a MRP concept will depend greatly on the confidence the NARF work centers have in NSC Oakland to support their requirements.

E. INTERIM PROPOSAL

The implementation date of 1 October 1979 does not provide sufficient time to construct the MRP computer programs, install the required computer hardware and train the NARF personnel. For the interim period, until MRP is functional, an OSI for all Cogs of expense items should be developed for the NARF utilizing the logic of the NAS Miramar VOSL test. This would provide management of the OSI within

budget parameters, allow for stockage of non-demand based items, and provide the mechanized listings required to manage the OSI. The primary consideration for recommending the VOSL program is that it is currently available, will provide a uniform product for all the items, and the Supply personnel are familiar with VOSL.

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APPENDIX A

NARF ALAMEDA PRODUCTION PROGRAMS [2]

Aircraft Program

During Fiscal Year 1978, the aircraft program accounted for 1.5 million or 29.9 percent of all direct hours worked at NARF Alameda.

A	B	C	D	E
A-3	12	18,330	15,583	(-) 2747
A-6	78	9,120	9,257	(+) 137
A-7	1	13,603	13,603	(+) 0
C-118	4	8,270	8,290	(+) 120
P-3	61	8,662	9,120	(+) 458
S-3	3	8,803	5,724	(+) 3079
TOTAL	159			

A-Type Aircraft Completed

B-Units

C-Direct Hour Norm

D-Direct Hour Expended

E-Average Variance

Program Costs (FY 78)

Labor	$ 18,925,000
Material	5,407,000
Other	256,000
Indirect	28,859,000
Total	$ 53,447,000

Missle Program

NARF Alameda provides a wide range of capabilities for repairing and modifying electronic sections of guided missiles. Alameda supports the U.S. Navy, U.S. Air Force and performs limited work for other customers. In Fiscal Year 1978, the missile program accounted for 135,000 or 2.7 percent of all direct hours.

A	B	C	D	E
SPARROW	1174	100	96	(-) 4
PHOENIX	191	124	106	(-) 18
SHRIKE	311	16	21	(+) 5
TOTAL	1676			

A- Type Missile Completed
B- Units
C- Direct Hour Norm
D- Direct Hour Expended
E- Average Variance

Program Costs (FY 78)

Labor	$ 1,769,000
Material	874,000
Other	1,000
Indirect	2,434,000
Total	$ 5,078,000

Engine Program

In Fiscal Year 1978, the engine program accounted for 590,000 hours or 11.9 percent of all direct hours.

A	B	C	D	E
J52	214	759	755	(-) 4
J65	40	810	690	(-) 120
J56	208	615	1107	(+) 492
TF34	68	607	663	(+) 56
TF41	127	639	636	(-) 3
Others	9	358	543	(+) 185
Total	666			
Gas Turbine Compressor				
	214	173	188	(+) 15
Gearbox and Torqaemeter				
	319	94	93	(-) 1

A- Type Engine Completed
B- Units
C- Direct Hour Norm
D. Direct Hours Expended
E- Average Variance

Program Costs (FY 78)

Labor	$ 7,531,000
Materials	15,145,000
Other	1,000
Indirect	10,168,000
Total	$ 32,845,000

Component Program

NARF Alameda has the capability of rework 13,000 federal stock numbered items. During Fiscal Year 1978, 1.3 million direct labor hours were expended on nearly 87,000 reworked units. Most of this annual production directly supports ASO. At the end of 1978, turn-around-time for all units averaged 33 days. Aircraft sub-assemblies (flaps, surfaces), avionics systems (ECM, radio radar) and engine components comprise the majority of Alameda's workload.

Program Costs (FY 78)

Labor	$19,879,000
Material	25,503,000
Other	243,000
Indirect	27,510,000
Total	$73,135,000

Other Support Program

The other support program is the most diverse program at NARF Alameda. It includes all direct work not included in the other programs and gives an excellent measure of the range of capabilities at Alameda. In Fiscal Year 1978, 1.2 million labor hours were expended on this program which was 24.4 percent of all hours worked. The following is a partial list of the major sub-programs.

Sub-programs

Aircraft Repair and Modification
Preservation
Pool Line Maintenance
Customer Service
Workload Control
Shipboard Work
Mobile Maintenance Facilities
Engineering Support
Manufacturing
Calibration and Standards

Program Costs (FY 78)

Labor	$ 15,643,000
Material	12,607,000
Other	938,000
Indirect	16,837,000
Total	$ 46,025,000

APPENDIX B

NARF ALAMEDA DECAY/BACKROBBING HOURS [6]

WORK CENTER CODE	WORK CENTER
52000	Production Planning Division
93000	Metal and Process Division
94000	Avionics Division Head
95000	Airframes Division
96000	Power Plant Division

	6/30/78		9/30/78		12/31/78		3/31/79		TOTAL
WORK CENTER	ME	MB	ME	MB	ME	MB	ME	MB	
52000	0	831	0	457	0	321	0	24	1633
93000	145	1203	134	1088	186	542	67	948	4313
94000	544	453	435	201	489	828	752	2966	6668
95000	3200	8133	3820	9233	3523	6888	5152	8083	48,032
96000	550	781	658	596	668	462	863	819	5397
TOTAL	4439	11444	5047	11575	4866	9049	6834	12,887	66,043

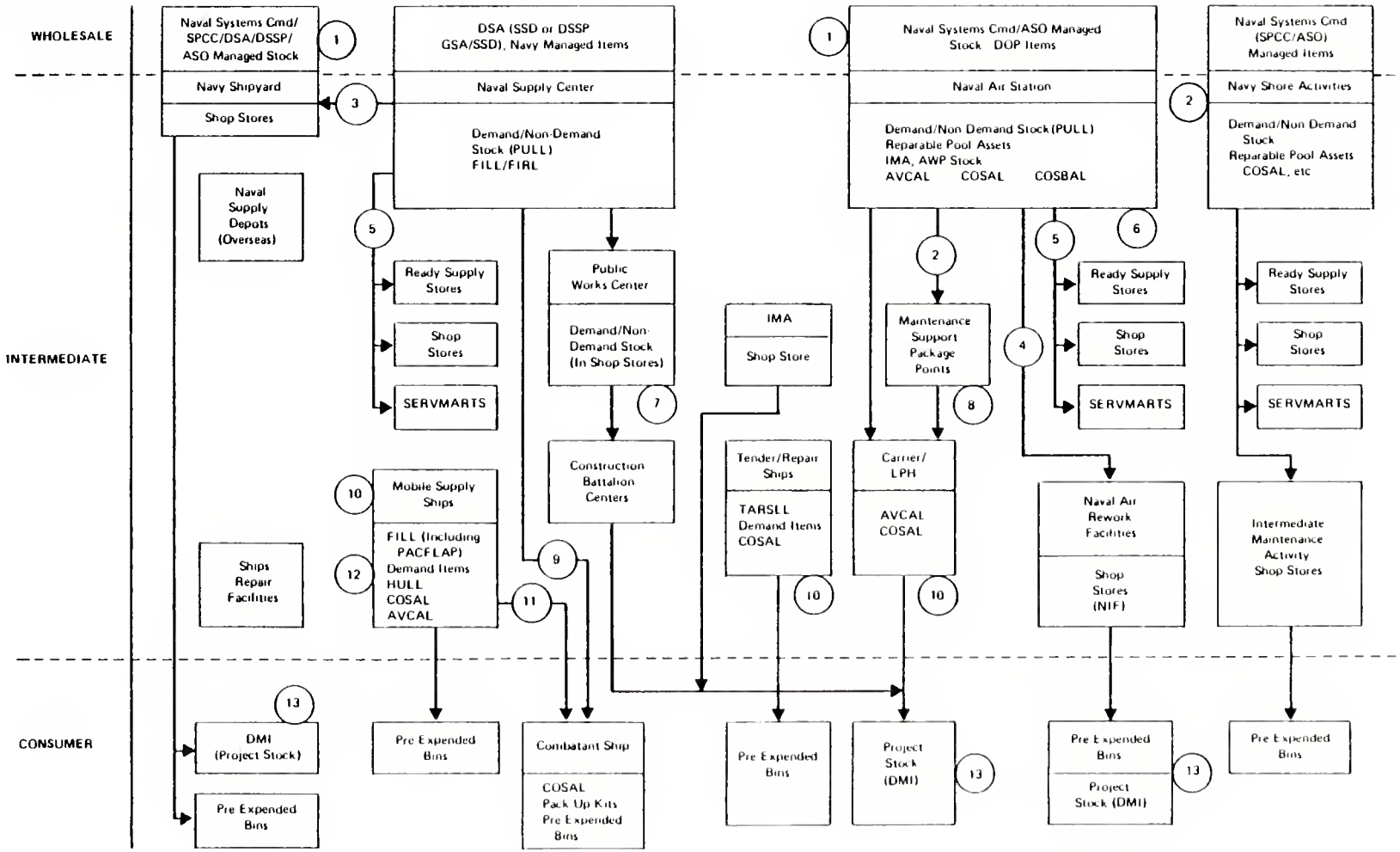
ME (DELAY) 21,186 HOURS

MB (BACKROB) 49,857 HOURS

APPENDIX C

NAVY INVENTORY LEVELS [10:IV-11]

NAVY INVENTORY LEVELS OF SUPPLY/MATERIEL FLOW



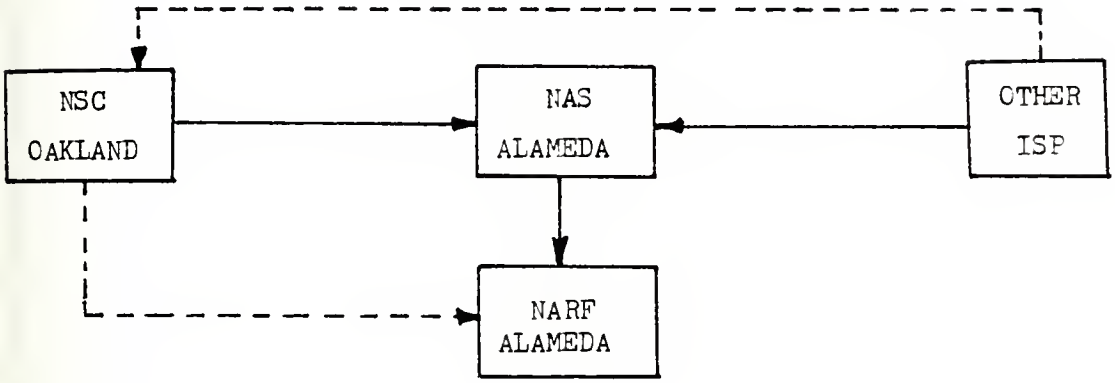
APPENDIX D

NARF ALAMEDA PRE/POST CONSOLICATION REQUISITION AND MATERIAL FLOW [5]

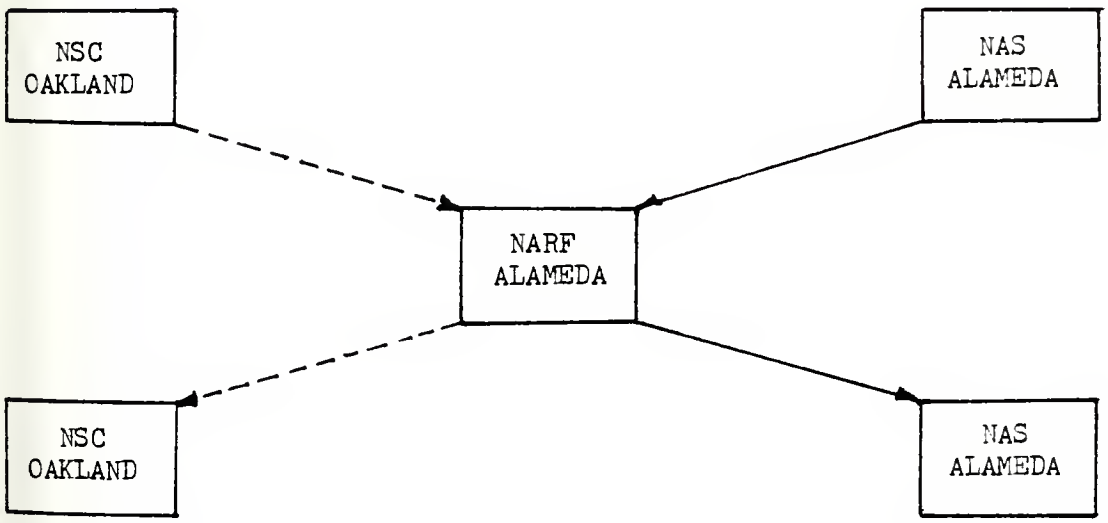
PRE/POST CONSOLIDATION

NARF MATERIAL FLOW

REQUISITIONED MATERIAL



INDUCTION OF NRFI MATERIAL

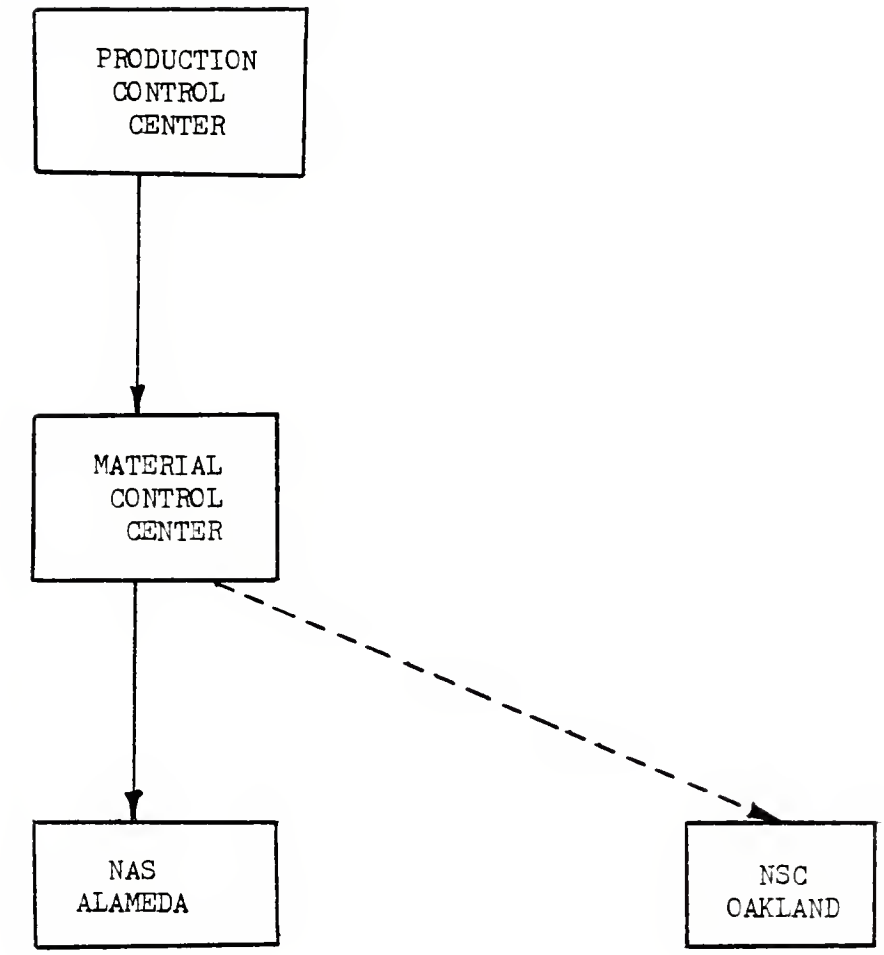


_____ Before consolidation

---------- After consolidation

PRE/POST CONSOLODATION

NARF REQUISITION FLOW



Before consolidation

After consolidation

APPENDIX E

NIMMS AUTOMATIC REPLENISHMENT [15:22-4]

AUTOMATIC REPLENISHMENT OF NIF RETAIL STORE ITEMS

Whenever a reduction in on-hand stock is caused by issue, an inventory loss, or a partial transfer between NIF stores, the NIF retail store items are tested to determine if automatic replenishment is required. If the replenishment code in the NIFIR master is other than "1", the related replenishment factor (RF) is divided by the replenishment factor plus 1 and multiplied by the stock level. If the result is equal to or greater than the sum of the on-hand and due-in quantities, replenishment documents are created in accordance with the review code in the NIFIR master. If the replenishment extended value exceeds the dollar value prescribed by the user and the NIFIR master has a "0" review code, documents will be produced for planner review vice direct input to the Supply system. The formula for determining when replenishment is required is as follows:

$$\frac{RF}{RF+1} \times \text{Stock Level} \geq \text{On-Hand} + \text{Due Quantity}$$

The replenishment code is a one-character numeric assigned by the Material Planner and is used as a factor when automatic replenishment of a NIF Retail Store item occurs.

The stock level is a six-character numeric indicator of the quantitative level of a specific item of NIF Retail Store material that initially the P&E has determined must be maintained to support production requirements or that has been automatically recomputed at quarter-end to reflect projected requirements based on historical usage data. DMI Stores always have a zero-filled stock level.

The replenishment quantity is based on the VAD (Value of Annual Demand) of the individual NIFIR master. During the quarterly processing cycle, the VAD of each NIF retail store item is computed by multiplying the sum of the past four quarters demand by the unit price (standard or store as applicable) and assigning a stratification category code ("1" through "5") to each Retail Store NIFIR. The low money value of annual demand for each category code is input by the user to specify the VAD range in the assignment of category codes and is used to determine the percentage of the total items that are assigned to each of the five categories:

a. The user specifies the low money value for each category code by means of a parameter card which is input to the quarterly processing cycle.

b. Items with high dollar value of annual demand are assigned a category code of "1."

c. Low dollar value of annual demand items are assigned a category code of "5."

d. When a new item is added, a stratification category code of "1" is assigned to the NIFIR master.

The quarterly processing cycle produces a "NIF Retail Store Stratification" report and a "Stratification Category Code Changes" report. The "NIF Retail Store Stratification" report indicates the percentage of items and the high and low dollar value intervals in each of the five categories. The "Stratification Category Code Changes" report indicates changes in category code and the current dollar value of annual demand. It is sequenced by NIIN within store.

The formulae used to determine replenishment quantities are as follows:

	No. of Days in Stock Level			
	50	60	75	90
Stratification Category Code 1				
30 days reorder quantity =				
$\frac{\text{Stock Level X}}{3}$	1.80	1.50	1.20	1.00
Stratification Category Code 2				
45 days reorder quantity				
$\frac{\text{Stock Level X}}{2}$	1.80	1.50	1.20	1.00
Stratification Category Code 3				
60 days reorder quantity =				
$\frac{\text{Stock Level X}}{3}$	3.60	3.00	2.40	2.00
Stratification Category Code 4				
75 days reorder quantity =				
Stock Level X	1.50	1.25	1.00	.83
Stratification Category Code 5				
90 days reorder quantity =				
Stock Level X	1.80	1.50	1.20	1.00

NOTE: The multiplier will change in accordance with the number of days in the stock level (i.e., if the Stratification Category Code is 3 and Number of Days in Stock Level is 60, the multiplier will be 3.000)

When a NIF retail store receipt record is processed, the document Julian date is subtracted from the current Julian date. If the result is less than 31, the replenishment code in the NIFIR master is changed to a "2." If the result is 31 through 60, the replenishment code is changed to "0." If the result is greater than 60, the replenishment code is changed to a "3." Modifying the replenishment code adjusts the replenishment point to compensate for requisition lead time. If the replenisnment code in the NIFIR master is a "1" or a "4", the replenishment code is not modified when a receipt is processed.

When NIFIR contains a Store Unit of Issue, a replenishment is calculated in multiples of the figure in the Conversion Factor field. In any one application of this replenishment formula, the Store Unit of Supply Unit of Issue increment before replenishment is generated. After the first full increment is satisfied, replenishment quantity is rounded off to the nearest full increment.

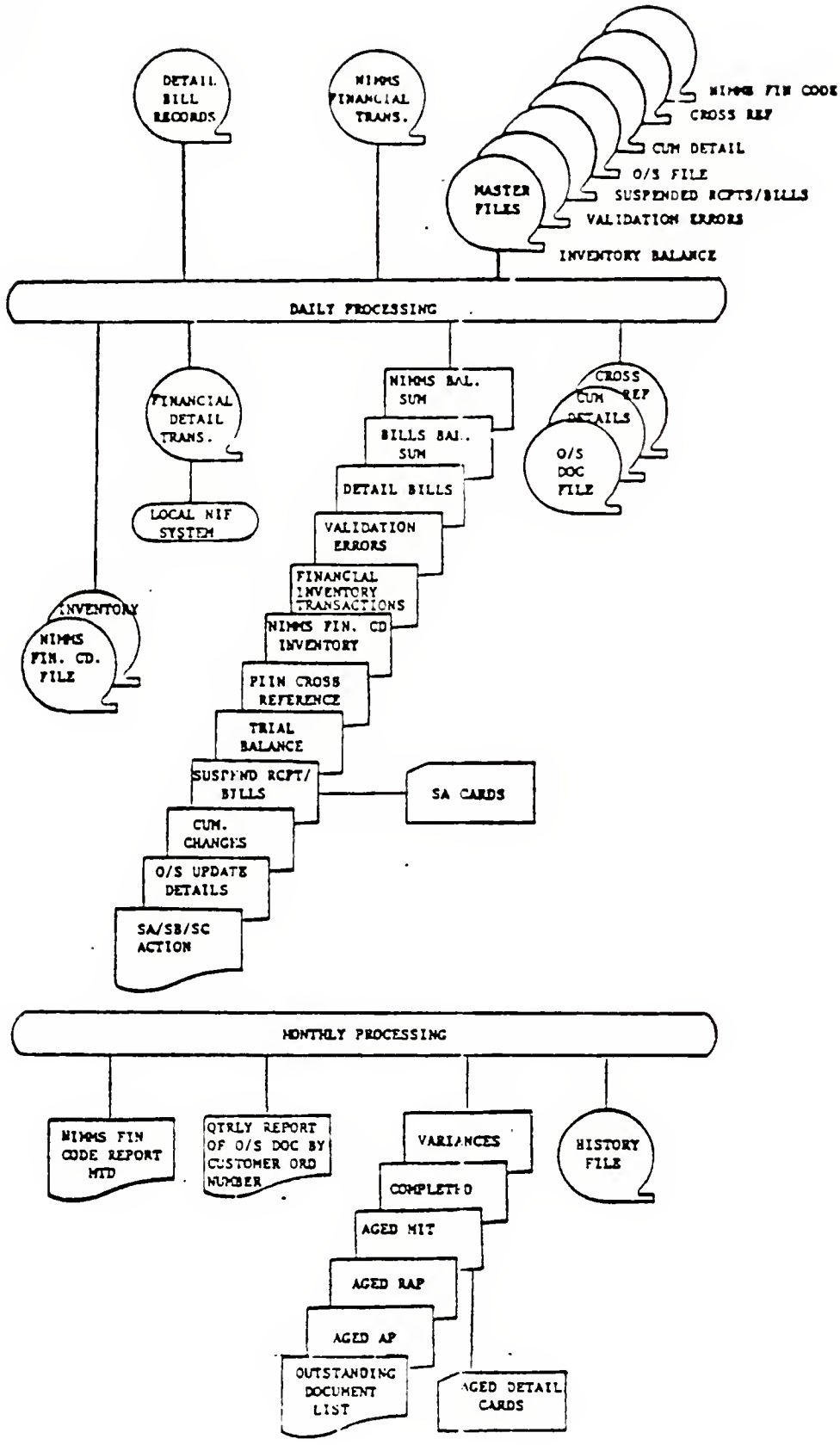
The item Review Code assigned to an item by Material Planning Personnel determines the number and type of reorder documents that are computer generated and distributed when a NIF Retail Store item meets the criteria for automatic

replenishment. These Review Codes and the actions they generate are as follows:

Code	Action
0 or blank	Creates a DD1348M with Document Identifier "AOA," and produces a Receipt Card. Increases the Quantity Due field of the NIFIR by the amount of the replenishment. (The DD1348M is submitted to Supply; the other cards are forwarded to the applicable NIF Retail Store.)
1	Creates a DD1348M with Document Identifier "AOA" and a Reorder Card. Both documents are forwarded to the applicable NIF Retail Store for review by the Material Planner.
2	Identifies items with exception data in the requisition. Creates a Reorder Card with Document Identifier "E" which is forwarded to the applicable NIF Retail Store for review by the Material Planner.
3	Identifies items with a zero Stock Level and Quantity On-Hand greater than zero. Creates a Reorder Card which is forwarded to the applicable NIF Retail Store for review by the Material Planner.

APPENDIX F

NIMMS FISCAL MANAGEMENT OVERVIEW [15:II-3]


DETAIL BILL RECORDS
NIMMS FINANCIAL TRANS.
MASTER FILES
NIMMS FIN CODE CROSS REF
CUM DETAIL
O/S FILE
SUSPENDED RCPTS/BILLS
VALIDATION ERRORS
INVENTORY BALANCE
DAILY PROCESSING
FINANCIAL DETAIL TRANS.
LOCAL NIF SYSTEM
NIMMS BAL. SUM
BILLS BAL. SUM
DETAIL BILLS
VALIDATION ERRORS
FINANCIAL INVENTORY TRANSACTIONS
NIMMS FIN. CD INVENTORY
FIIN CROSS REFERENCE
TRIAL BALANCE
SUSPEND RCPT/ BILLS
SA CARDS
CUM. CHANGES
O/S UPDATE DETAILS
SA/SB/SC ACTION
CROSS REF
CUM DETAILS
O/S DOC FILE
INVENTORY
NIMMS FIN. CD. FILE
MONTHLY PROCESSING
NIMMS FIN CODE REPORT MTD
QTRLY REPORT OF O/S DOC BY CUSTOMER ORD NUMBER
VARIANCES
COMPLETED
AGED MIT
AGED RAP
AGED AP
OUTSTANDING DOCUMENT LIST
AGED DETAIL CARDS
HISTORY FILE

APPENDIX G

NAS ALAMEDA "G" CONDITION MATERIAL [16]

NAS ALAMEDA

"G" CONDITION MATERIAL
(1979)

COMPONENT STATUS

(AVERAGE)	APRIL	MAY	JUNE
LINE ITEMS	871	871	863
COMPONENTS	4972	4447	4518
PARTS RECEIVED	196	247	90

BIT/PIECE STATUS

	APRIL	MAY	JUNE
MATERIAL DUE	4772	4796	5531
MATERIAL ONHAND	5328	4733	4641
TOTAL	10,100	9528	10,172

DOLLAR VALUE (MILLION)

	APRIL	MAY	JUNE
COMPONENTS	30.2	27.2	29.1
BIT/PIECES	1.5	1.6	1.4

CONDITION CODE TRANSFER

CONDITION CODE	APRIL	MAY	JUNE
M TO G	404	344	495
G TO M	1224	342	318
G TO F	102	79	16

F- Unserviceable (Repairable Carcass)

G- Unserviceable (Incomplete-Awaiting Parts)

M- Suspended (In Work)

APPENDIX H

NAS ALAMEDA SUPPLY EFFECTIVENESS [18]

NAS ALAMEDA SUPPLY POE EFFECTIVENESS

FOR

NARF ALAMEDA
(JAN 79-MAR 79)

COG	JAN	FEB	MAR	TOTAL
9A	40.0	36.8	20.0	31.8
9C	34.3	35.4	34.2	34.6
9D	58.1	76.3	40.0	56.3
9E	50.0	14.3	42.9	35.0
9F	26.1	18.5	32.3	24.9
9G	47.7	40.9	44.7	44.4
9H	40.0	20.0	40.0	33.3
9I	2.3	6.3	8.7	6.3
9J	30.5	26.4	30.3	28.8
9K	10.9	3.6	0.0	5.0
9N	35.6	37.0	35.2	35.9
9O	11.8	0.0	0.0	6.3
9Q	54.3	47.9	49.9	50.2
9S	0.0	0.0	0.0	0.0
9V	42.4	45.3	34.3	40.5
9W	28.0	25.4	34.6	29.9
9Y	34.6	34.2	58.8	42.9
9Z	45.2	42.8	43.7	43.8
1H	50.0	59.9	55.2	55.7
1R	52.4	53.5	53.5	53.2

"BIG FIVE" SSD COGS (9C, 9D, 9G, 9 N AND 9Z) 40.8

NAS ALAMEDA POE DEMANDS

FROM

NARF ALAMEDA

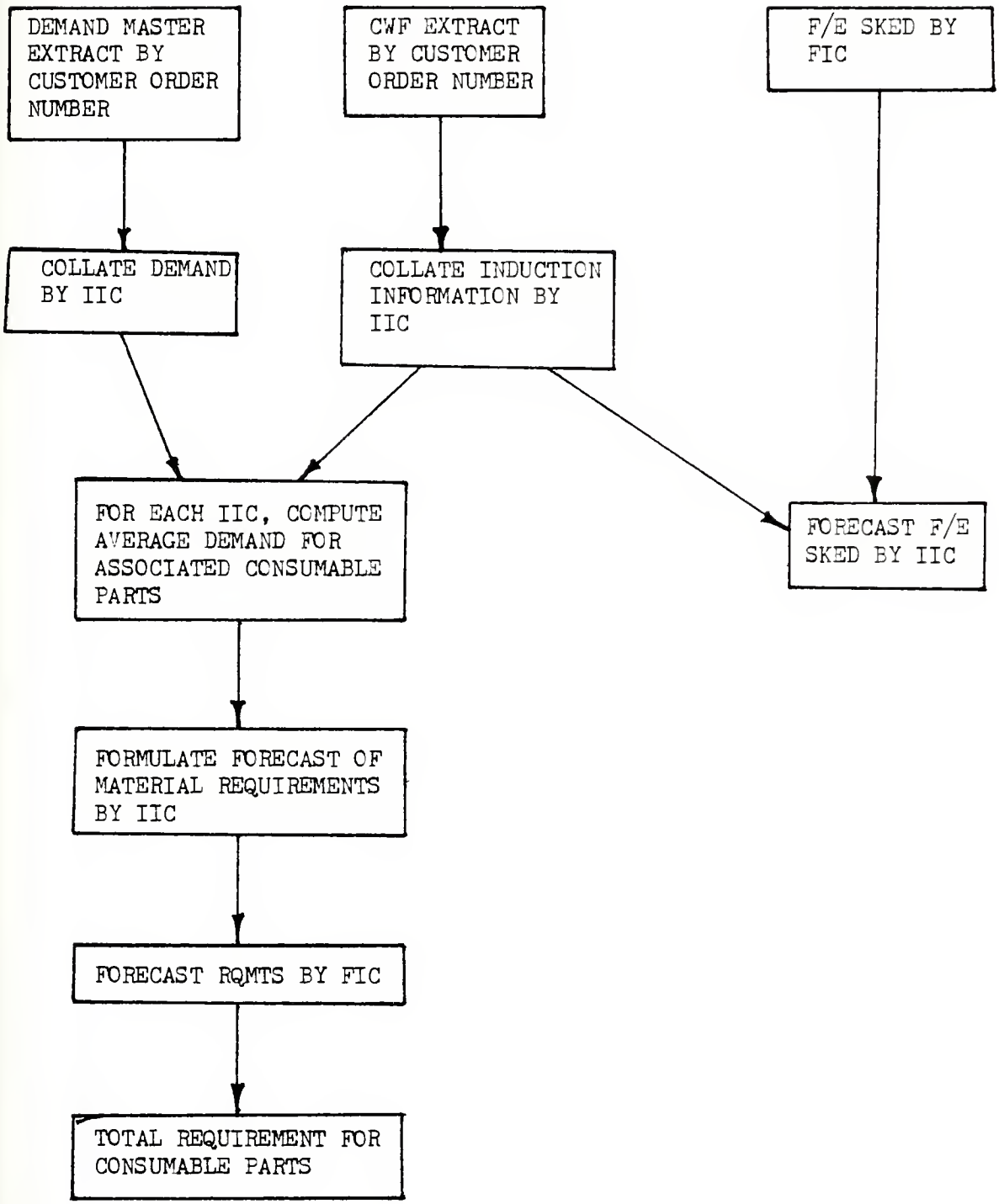
(JAN 79-MAR 79)

COG	JAN	FEB	MAR	TOTAL
9A	10	19	15	44
9C	915	975	1066	2956
9D	31	38	50	119
9E	6	7	7	20
9F	92	157	124	373
9G	837	867	1098	2802
9H	5	5	5	15
9I	44	63	69	176
9J	325	432	356	1113
9K	46	28	46	120
9N	2261	2256	2846	7363
9O	17	5	10	32
9Q	645	974	984	2603
9S	5	1	---	6
9V	628	894	864	2386
9W	50	59	78	187
9Y	26	38	34	98
9Z	4374	5065	5244	14683
1H	98	157	183	438
1R	2489	2984	3580	9053
2R	173	271	309	753
5R	214	140	58	412
6R	11	6	5	22
8R	3	12	48	63
TOTAL				45837

APPENDIX I

NARF ALAMEDA MRP [5]

NARF ALAMEDA F/E MRP



APPENDIX J

ASO OPERATIONAL SUPPORT INVENTORY FUNDING [25]

ASO OPERATIONAL SUPPORT INVENTORY FUNDING

I. OSI FUNDING EXCLUDING SUBIC IN MILLIONS OF DOLLARS

		FISCAL YEAR					
	TOTAL	76	7T	77	78	79	80
NSF	$16.3	5.9	4.9	5.7			
APN	$59.4				14.0	45.4	
OSMN REWORK FUNDS	$31.4				10.5	20.9	

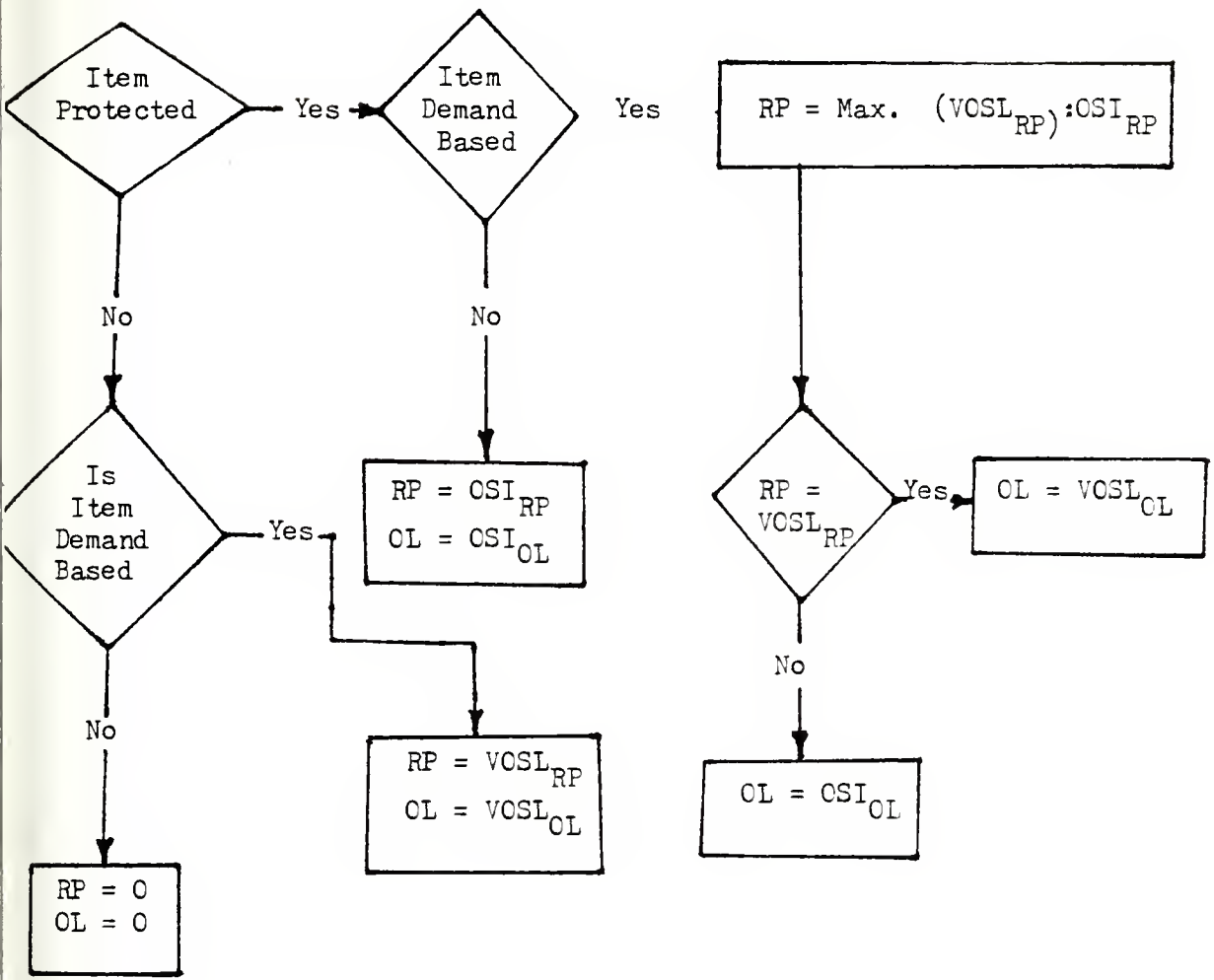
II. NAS SUBIC OSI FUNDING IN MILLIONS OF DOLLARS

		FISCAL YEAR					
	TOTAL	76	7T	77	78	79	80
NSF	$ 8.3				8.3		
APN	$20.1					9.4	10.7
O&MN	$ 4.5				4.5		

APPENDIX K

NAS MIRAMAR 1R COG VOSL TEST PARAMETERS

DETAILED INVENTORY DECISION RULES [26]



Where =

RF = Final Reorder Point Quantity.

OL = Final Operating Level Quantity.

* OSI_{RP} = Operational Support Inventory Reorder Point.

OSI_{OL} = Operational Support Inventory Operating Level.

$VOSL_{RP}$ = VOSL Reorder Point.

$VOSL_{OL}$ = VOSL Operating Level.

* OSI_{RP} = $\frac{1}{2}$ (OSI Requisitioning Objective)

VOSL CONSTRAINT PARAMETER SETTINGS [25]

Constraint	Setting	Remarks
1. Average leadtime	1.3 months	Leadtime used when leadtime field is blank.
2. Frequency Preclusion	0	All items presently examined will be a VOSL candidate if they have had any demand in past year.
3. Zero Safety Level Frequency Cutoff	0	
4. Average Investment Level	2.5 months	
5. Minimum Risk	.01	
6. Maximum Risk	.50	
7. Maximum Leadtime	2 months	
8. Lamboa Prime	0.0013	
9. YAD Category	QMC	Upper Bound
A	1.0	9999999.99
B	1.5	4992.31
C	2.0	2446.23
D	2.5	1455.76
E	3.0	966.51
F	4.0	611.56
G	5.0	363.94
H	6.0	241.63
I	8.0	152.89
J	12.0	78.00

NAS MIRAMAR 1R COG

VOSL ANALYZER SUMMARY STATISTICS [25]

AIL = 2.5 MONTHS

	SL = 1.0	SL = 1.3	SL = 1.5	SL = 1.8
$AIL	$1,534,703	$1,518,331	$1,532,371	$1,520,510
$ SL	$ 610,652	$ 771,167	$ 917,305	$1,082,044
SL MOS	1.00	1.26	1.49	1.76
$ ½ OL	$ 924,113	$ 747,200	$ 615,080	$ 438,475
½ OL MOS	1.50	1.22	1.00	.71
$ RL DEF	$ 112,027	$ 147,940	$ 191,790	$ 254,053
IMM BUYS	1,431	1,591	1,767	1,878
$ IMM BUYS	$ 574,693	$ 583,565	$ 573,251	$ 532,552
TOT BUYS	6,427	8,299	11,418	27,193
$ TOT BUYS	$6,202,776	$6,226,757	$6,254,284	$6,265,796
ANALYZER NET REQN EFF	96%	96%	96%	83%
ANALYZER SALES EFF	81%	79%	78%	16%

where:

$ AIL = average investment level

$ SL = safety level investment

SL = safety level in months of supply

$ ½ OL = average operating level investment

½ OL MOS = average operating level in months of supply

$ RL DEF = deficiency to final reorder point

IMM BUYS = first day buys

$ IMM BUYS = value of first day buys

TOT BUYS = number of projected annual replenishments

$ TOT BUYS = projected annual replenishment requirements

ANALYZER NET REQN EFF = projected VOSL Analyzer net requisition effectiveness

ANALYZER SALES EFF = projected VOSL Analyzer sales effectiveness

The results of the summary indicate that net requisition effectiveness is not improved by the reallocation of funds from operating level to safety level. In fact, when safety level is set equal to 1.8 months of supply, the projected net effectiveness is reduced by 13 percentage points. Further, as more funds are placed in safety level, the procurement workload is increased and sales effectiveness is decreased. The parameter which allocates one month to safety level and 1.5 months to average operating level were selected as the most effective for 1R Cog VOSL at NAS Miramar. [25:6]

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